Reconnaissance and Targeted Flora and Vegetation Survey

Waughs Road, Manjimup

Prepared for Brumby Lane Land Holdings
January 2022

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Executive summary

A targeted and reconnaissance flora and vegetation survey was undertaken of 37 hectares of vegetation on within Lot 9766, Lot 9767, Lot 9768 and Lot 9770 Waughs Road, Glenoran (the 'survey area'), within the Shire of Manjimup, Western Australia.

The survey was undertaken in support of a clearing permit application (CPS 9047/1) submitted to the Department of Water and Regulation by Brumby Lane Land Holdings Pty Ltd. This survey is required to identify any key flora and vegetation constraints within the survey area.

The survey was undertaken on the 27 and 28 October 2021 in accordance with the EPA (2016) Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment.

The total area surveyed was approximately 37 hectares (ha), almost all of which was native vegetation.

One hundred and sixteen vascular flora taxa were identified within the survey area, of which twenty-eight were introduced species. No Flora listed as Threatened under the EPBC Act or the BC Act were found within the survey area. In addition, no Priority flora or other flora of conservation significance (including non-vascular flora) were found.

The post-survey likelihood of occurrence of the seven potential significant vascular flora, including Threatened flora, was "unlikely", except for a P1 grass that was assigned a post-survey likelihood of "possible" because it would not have been flowering at the time of the survey.

Rubus anglocandicans (blackberry), which was very common in the creeklines (wetlands), is a Declared Pest (s22(2)) under the *Biosecurity and Agriculture Management Act* 2007. It is in the C3, exempt category. There were no Weeds of National Significance.

Four vegetation units were identified within the survey area. Two of them (units A and B), the most extensive units, were upland forest types. The other two (C1 and C2) were situated along ephemeral streams that have been dammed in several places. None of the vegetation units resembled a TEC or PEC or were part of any restricted vegetation type.

Over 90% of the survey area vegetation is in Good-or-better condition. The Degraded and Completely Degraded vegetation is mainly associated with the riparian areas or with a stand of karri in the northwest part of the survey area where the understorey is comprised solely of pasture species.

Two vegetation complexes are mapped to occur across the survey area, the Crowea Complex (CRb) and the Yanmah Complex (YN1). The Crowea Complex makes up the greatest proportion of the survey area by area. The survey area vegetation is characteristic of these complexes in terms of dominant species and structure, and all have more than 30% of their pre-European extent of native vegetation remaining.

One of Beard's vegetation associations, Association 1144, is mapped across the survey area. The survey area vegetation also meets the broadly described characteristic of this association in terms of dominant species and structure, and more than 30% of its pre-European extent of native vegetation remains.

Almost all the vegetation within the survey area forms part of a mapped ecological linkage associated with uncleared vegetation within the DBCA managed State Forest with vegetated portions in the southern half of the area assigned the highest 1a proximity value rating as they are contiguous with vegetation associated with this linkage.

There are no ESAs located within the survey area. However, there is an ESA located 75 m southwest of the survey area along the length of its southwest boundary.

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Statement of limitations

Reliance on data

In the preparation of this report, Ecoedge has relied on data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the report. Unless stated otherwise in the report, Ecoedge has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report are based in whole or in part on the data, those conclusions are contingent upon the accuracy and completeness of the data. Ecoedge will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, unavailable, misrepresented or otherwise not fully disclosed to Ecoedge.

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1 Introduction

Ecoedge Environmental Services (Ecoedge) was engaged by Brumby Lane Land Holdings Pty Ltd (the client) in July 2021 to undertake a reconnaissance and targeted flora and vegetation survey of 36.73 hectares (ha) of vegetation within their rural landholding (part Lot 9766 on Deposited Plan 153017, part Lot 9767 on Deposited Plan 203103, part Lot 9768 on Deposited Plan 203103, and part Lot 9770 on Deposited Plan 203103) off Waughs Road, Glenoran (the 'survey area'), within the Shire of Manjimup **Figure 1.**

Brumby Lane Land Holdings are seeking a permit (CPS 9047/1) from the Department of Water Environment and Regulation (DWER) for the clearing of this vegetation for the purpose of horticulture and requires the survey to identify any key flora and vegetation constraints within the survey area.

The survey area is located approximately nine kilometres (km) west of the town of Manjimup. It is located within cleared agricultural land adjacent to the DBCA managed Donnelly State Forest **Figure 1** and **Figure 2.**

This report compiles the findings of the survey.

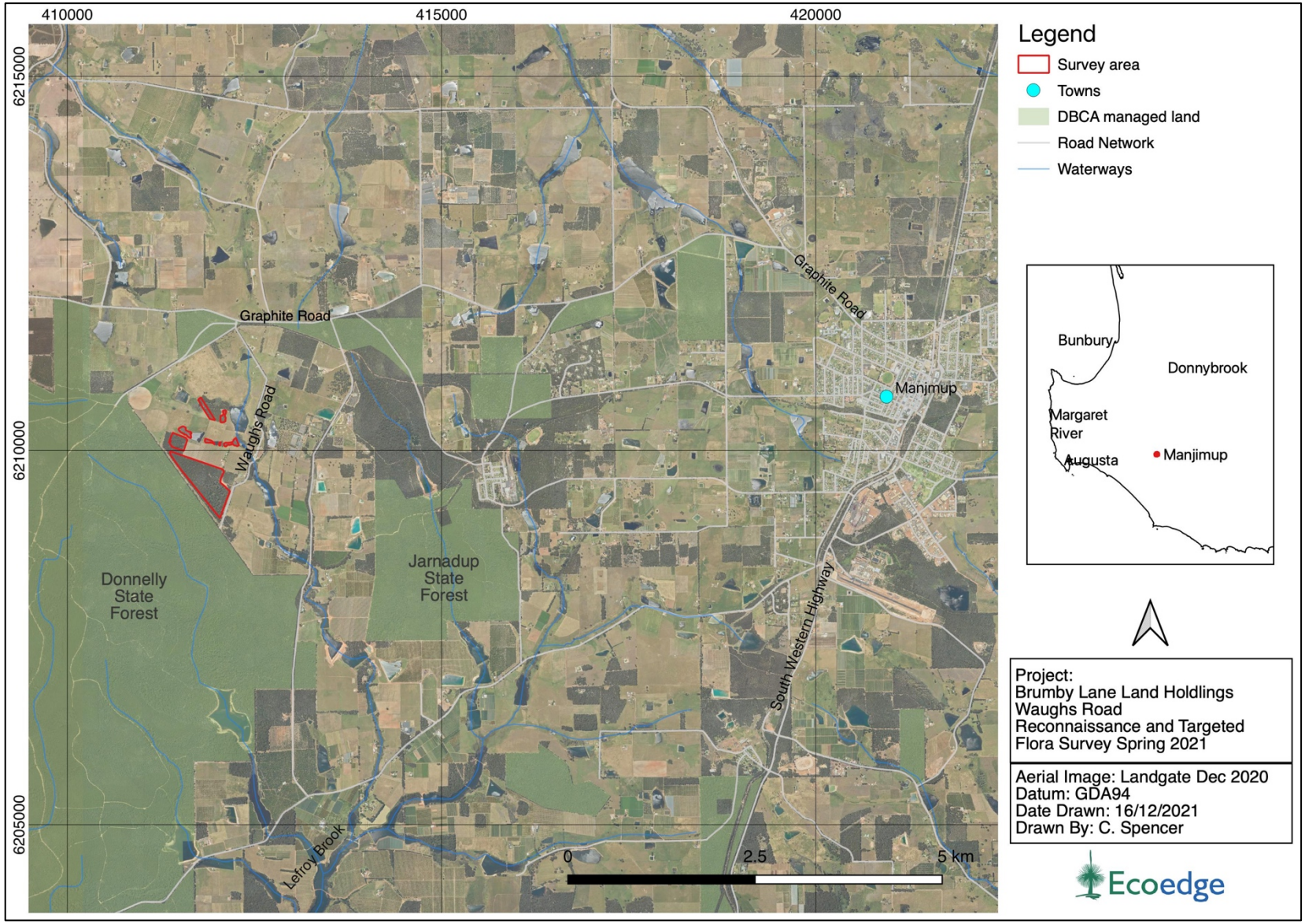

Figure 1. Aerial photograph showing the regional context of the survey area.

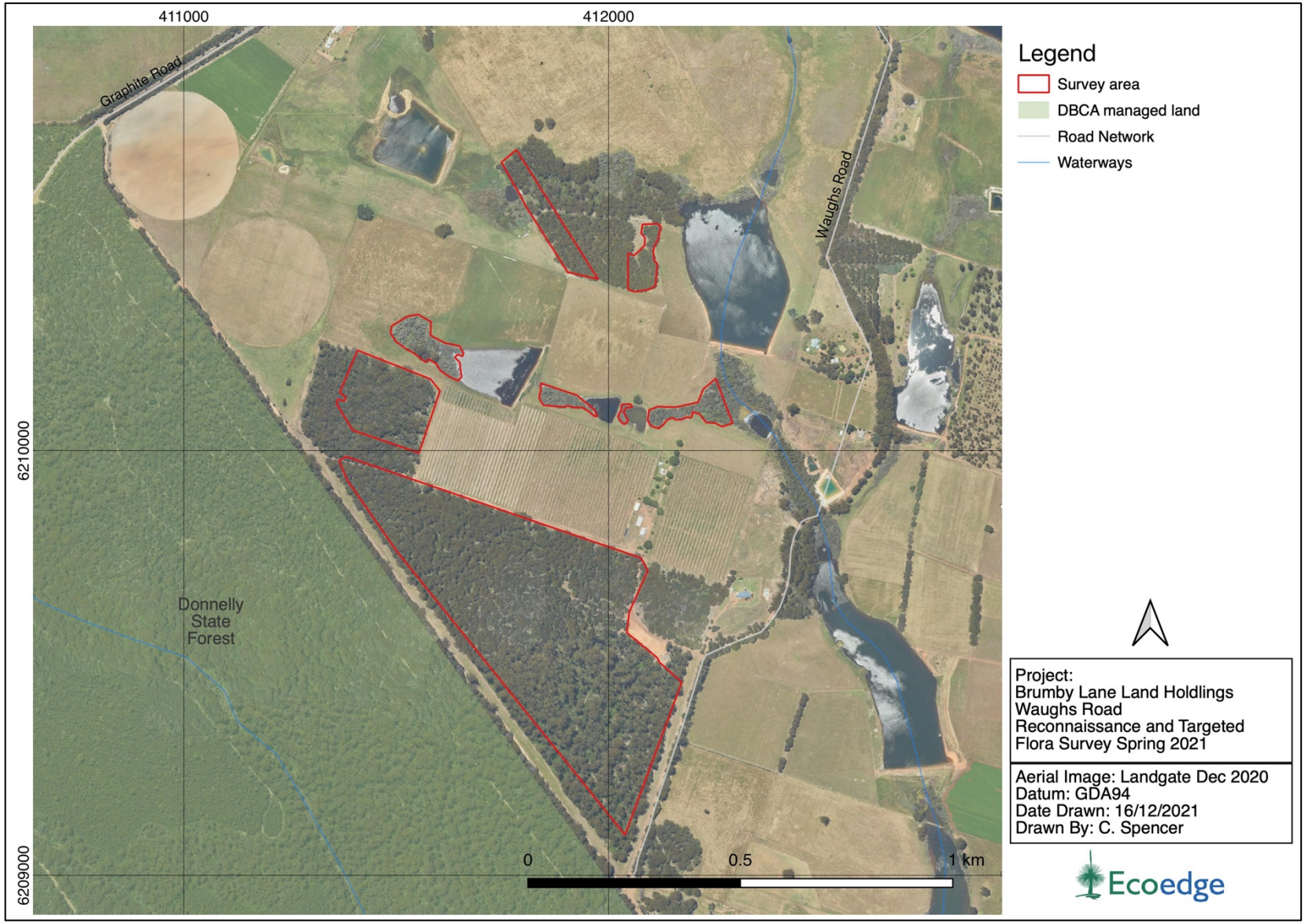

Figure 2. Aerial photograph showing the location of the survey area.

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2 Scope and objectives

The objective of the survey was to provide a report on outcomes of a targeted and reconnaissance flora and vegetation survey that delineated key flora and vegetation within the approximately 37 ha survey area.

The scope required a desktop assessment to be conducted prior to the field survey work to identify all biological features and constraints, which were in, or nearby the survey area, such as significant flora, Threatened and Priority ecological communities (TEC and PEC), riparian vegetation, unusual soil/landscape systems (e.g., granite outcrops), conservation estates, poorly represented vegetation associations and or vegetation complexes and environmentally sensitive areas (ESA).

The client required a survey to ground truth outcomes of the desktop assessment, including, as necessary, a targeted flora survey for potential significant flora and a targeted vegetation survey for any potential occurrences of TEC and PECs. The survey also required mapping of weeds of national significance (WONS), declared pest plants listed under the *Biosecurity and Agriculture Management Act 2007* (BAM Act) and mapping of riparian vegetation.

The survey and report were required to be undertaken in accordance with the Environmental Protection Authority (EPA) Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016) and other State and Commonwealth guidelines for threatened species and communities, such as approved conservation advice for *Environmental Protection and Biodiversity Act 1999* (EPBC Act) threatened species and communities.

3 Methods

3.1 Desktop assessment

Prior to the field survey, a desktop assessment was undertaken over a 10 km buffer area (the 'study area') to provide contextual information on the flora and vegetation within the survey area. The desktop studies included a review of the following information.

- Regional geology and soil mapping (Churchward 1992).
- Vegetation complex mapping of the southwest forest region of Western Australia (Mattiske and Havel 1998) as updated by Webb et al. (2016).
- WA TEC and PEC Department of Biodiversity Conservation and Attraction (DBCA) database extracts (DBCA 2021a) and TEC and PEC listings (DBCA 2018a, DBCA 2021b).
- Extract from the Department's Threatened Flora database and the Western Australian Herbarium database (DBCA 2021c)
- Threatened and Priority flora Naturemap search results (DBCA 2021d).
- Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search Tool (PMST) results (DAWE 2021).
- Declared rare and poorly known flora in the Warren Region (Hearn et al. 2006).
- Environmentally sensitive areas distribution maps and data (DWER 2020).
- Surface hydrology lines (National) (Crossman & Li 2015).
- Regional ecological linkages (Molloy et al. 2009).

3.1.1 Significant flora likelihood of occurrence

The method for determining the pre and post-survey likelihood of occurrence for conservation significant flora within the survey area is provided in **Appendix 1**

3.2 Field survey

The flora and vegetation survey was undertaken on the 27 and 28 October 2021 by Russell Smith (flora permit FB61000473) and Colin Spencer (flora permit FB62000169) in accordance with the EPA Technical Guidance (EPA 2016).

The targeted survey for Threatened and Priority flora involved inspecting all potential habitat, including drainage lines and stream sides. The time of the survey was within the optimum time for field identification of most of the Threatened and Priority flora identified as potentially occurring within the survey area.

Dominant and characteristic species, as well as some soil information, was collected at relevés across the survey area, and vegetation condition was recorded at these and other points. This information was used to describe vegetation units. In total, 128 vegetation condition points and 97 relevés, as well as track files, were recorded.

The relevé information was used to identify and describe vegetation units using the National Vegetation Information System (NVIS) (Level 5; DEHA 2003).

Flora species not identified in the field were either photographed or collected for later identification.

Vegetation condition was assessed using the method of the EPA (2016) (**Appendix 2**).

3.3 Survey limitations

Potential limitations with regard to the assessment are addressed in **Table 1.**

Table 1. Limitations of the field survey with regard to assessment adequacy and accuracy.

Aspect	Constraint	Comment
Scope	Not a constraint	The survey scope was prepared in consultation with the Client and was designed to comply with EPA requirements.
Proportion of flora identified	Low	The survey was carried out within the prime flowering season for the high rainfall south-west forests.
Climatic and seasonal effects	Low	Climate and seasonal effects for the region had negligible impact on the survey. Rainfall from Manjimup, the nearest station, showed that rainfall for the year until the time of survey was 96% of the long-term mean.
Availability of contextual information	Low	A number of regional surveys of flora and vegetation and more localised surveys have been carried out within the Warren Region.
Completeness of the survey	Low	Most of the survey area vegetation was easily accessible, although the vegetation in places was very thick. Blackberry brambles prevented access to parts of the creekline vegetation.
Skill and knowledge of the botanists (vascular flora)	Not a constraint	The botanists have a combined 35 years of experience in flora surveys in the southwest of WA.
Disturbance (fire, grazing, clearing etc.)	Low-moderate (in some areas)	Some logging had taken place in the karri and jarrah forest.

4 Desktop assessment results

4.1 Biogeographic region

The survey area is situated within the Warren biogeographic region (WAR), as defined in the Interim Biogeographical Regionalisation for Australia (IBRA) (Commonwealth of Australia 2016).

4.2 Landform and soils

The survey area occurs on two landform systems within the Denmark Southland Zone (254): the Pimelia Valleys system (254Pv) and the Dwalganup system (254Dw) (Churchward 1992).

The Dwalganup system occurs within the Southern Forests between Nannup and Deep River. It has a typically undulating terrain with moderately incised valleys, shallow minor valleys and remnants of lateritic plateau. It comprises a deeply weathered mantle of loamy gravels, duplex sandy gravels, and friable red/brown loamy earths over weathered metasediments and granitic rocks (Churchward 1992).

The Pimelea Valleys system occurs within the Southern Forests between the Donnelly River and Northcliffe. It has a typically undulating terrain with deeply incised valleys, shallow minor valleys and gravelly ridges. It comprises a deeply weathered mantle and colluvium of loamy gravels, friable red/brown loamy earths and brown deep loamy duplexes over metasediments and granitic rocks (Churchward 1992).

These systems have been separated into subsystems and then into soil phases based on landscape position and soil characteristics. Three phases have been described for the survey area and are summarised in **Table 2** and shown in **Figure 3**.

Table 2. Soil mapping units occurring within the survey area (Churchward 1992).

System	Subsystem	Soil phase
254Pv – Pimelia Valleys System	254PvCR Crests and upper slopes of spurs and ridges.	254PvCRy Crowea (Pimelia), yellow duplex phase Broad ridge crests with gravelly pale grey-brown loamy sand to sandy loam over mottled yellow, yellow-brown and grey clay. Lateritic boulders uncommon. Marri-jarrah-karri forest
		254PvCRb Crowea (Pimelia), brown duplex phase Broad ridge crests with brown loamy gravels, red deep loamy duplexes and friable red/brown loamy earths. Karri-marri-banksia-she oak forest
254Dw-Dwalganup System	254DwCR Crests and upper slopes of spurs and ridges.	254DwCRy Crowea (Dwalganup), yellow duplex phase Broad ridge crests with gravelly pale grey-brown loamy sand to sandy loam over mottled yellow, yellow-brown and grey clay. Lateritic boulders uncommon. Marri-jarrah-karri forest

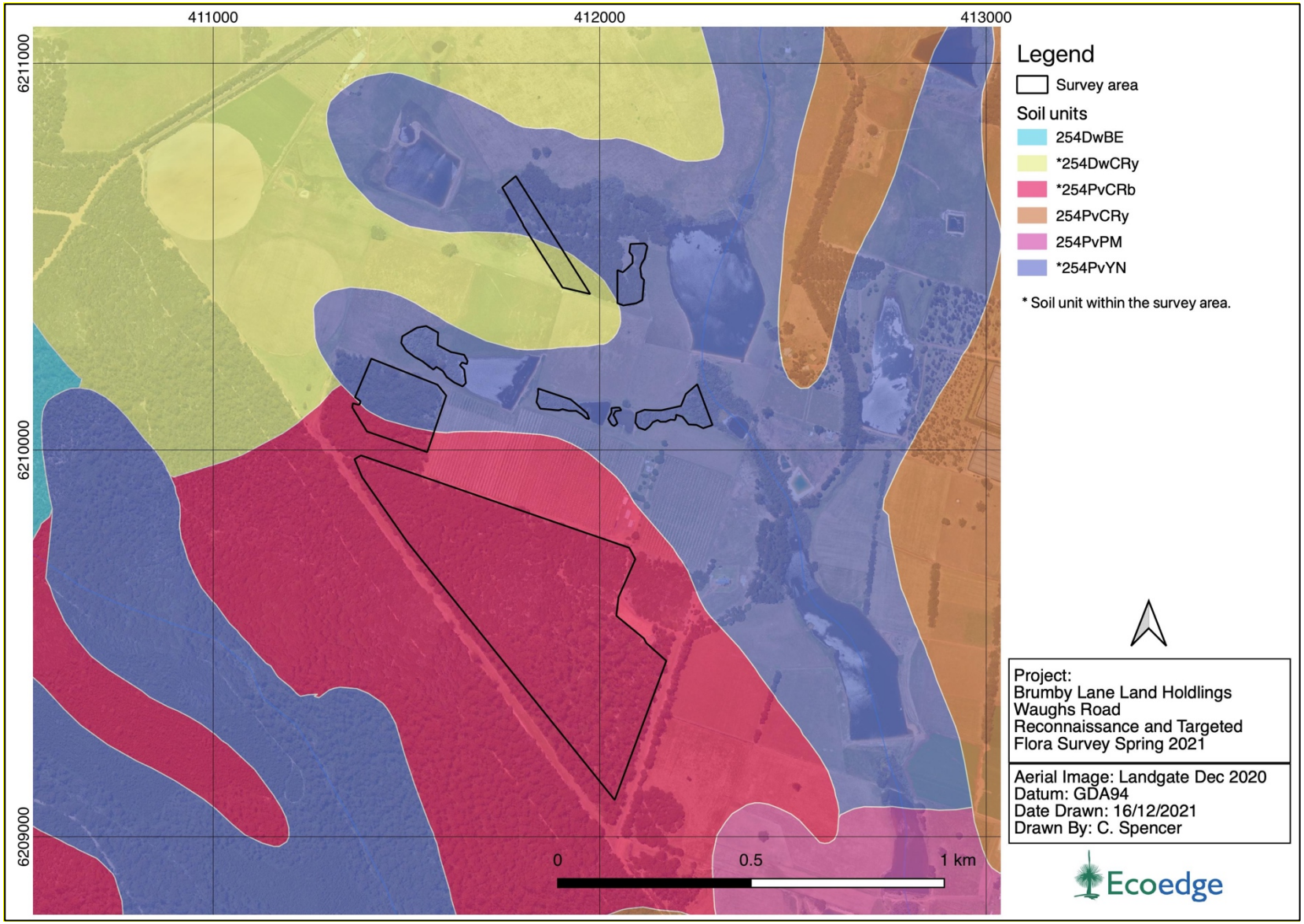

Figure 3. Soil units mapped in and nearby the survey area (Churchward 1992).

4.3 Vegetation description according to pre-European mapping datasets

4.3.1 Complexes

In 2016, the Department of Parks and Wildlife (DPaW) revised the vegetation mapping datasets for the Darling Scarp and Plateau Regional Forest Agreement (RFA) mapping of Mattiske and Havel (1998) and the Swan Coastal Plain mapping of Heddle et al. (1980). The purpose of the revision was to fill data gaps and improve alignment and correlation between the two datasets (Webb et al. 2016).

Two vegetation complexes occur within the survey area, according to the 1:50,000 mapping of the southwest forest region of Western Australia (Mattiske & Havel 1998) as updated by Webb et al. (2016). These are described in **Table 3** and shown in **Figure 4.**

Table 3. Vegetation complexes mapped for the survey area (Webb et al. 2016).

Vegetation Complex	Description
Crowea (CRb)	Tall open forest of *Corymbia calophylla - Eucalyptus diversicolor* on upper slopes with *Allocasuarina decussata - Banksia grandis* on upper slopes in hyperhumid and perhumid zones.
Yanmah (YN1)	Mixture of tall open forest of *Eucalyptus diversicolor* and tall open forest of *Corymbia calophylla - Eucalyptus patens - Eucalyptus marginata* subsp. *marginata* over *Agonis flexuosa* and *Agonis juniperina* on valleys in perhumid and humid zones.

4.3.2 Vegetation associations

A systematic survey of native vegetation in Western Australia was undertaken by J. S. Beard (along with others) during the 1970s, which described vegetation systems in the southwest of Western Australia at a scale of 1:250,000. Beard's vegetation maps attempted to depict the vegetation as it might have been prior to European settlement in terms of type and extent (Beeston et al. 2001). The Beard vegetation association dataset, also referred to as the pre-European native vegetation extent dataset, was digitised by Shepherd et al. (2002).

Beard vegetation associations have been described to a minimum standard of Level 3 "Broad Floristic Formation" for the National Vegetation Inventory System (NVIS) (state-wide to regional scale) [1].

One Beard vegetation association, association 1144, is mapped across the survey area. This is described in **Table 4** and shown in **Figure 5.**

Table 4. Beard vegetation associations mapped for the survey area.

Vegetation association	Description
1144	'Tall forest; karri & marri (*Corymbia calophylla*)'

[1] Beard's vegetation mapping units are referred to as 'associations' however these do not correspond to the NVIS Level 5 'Associations'. The NVIS system was developed long after Beard's work was completed, and while both classification systems use the same term, NVIS 'Associations' describe vegetation in more detail than do Beard's.

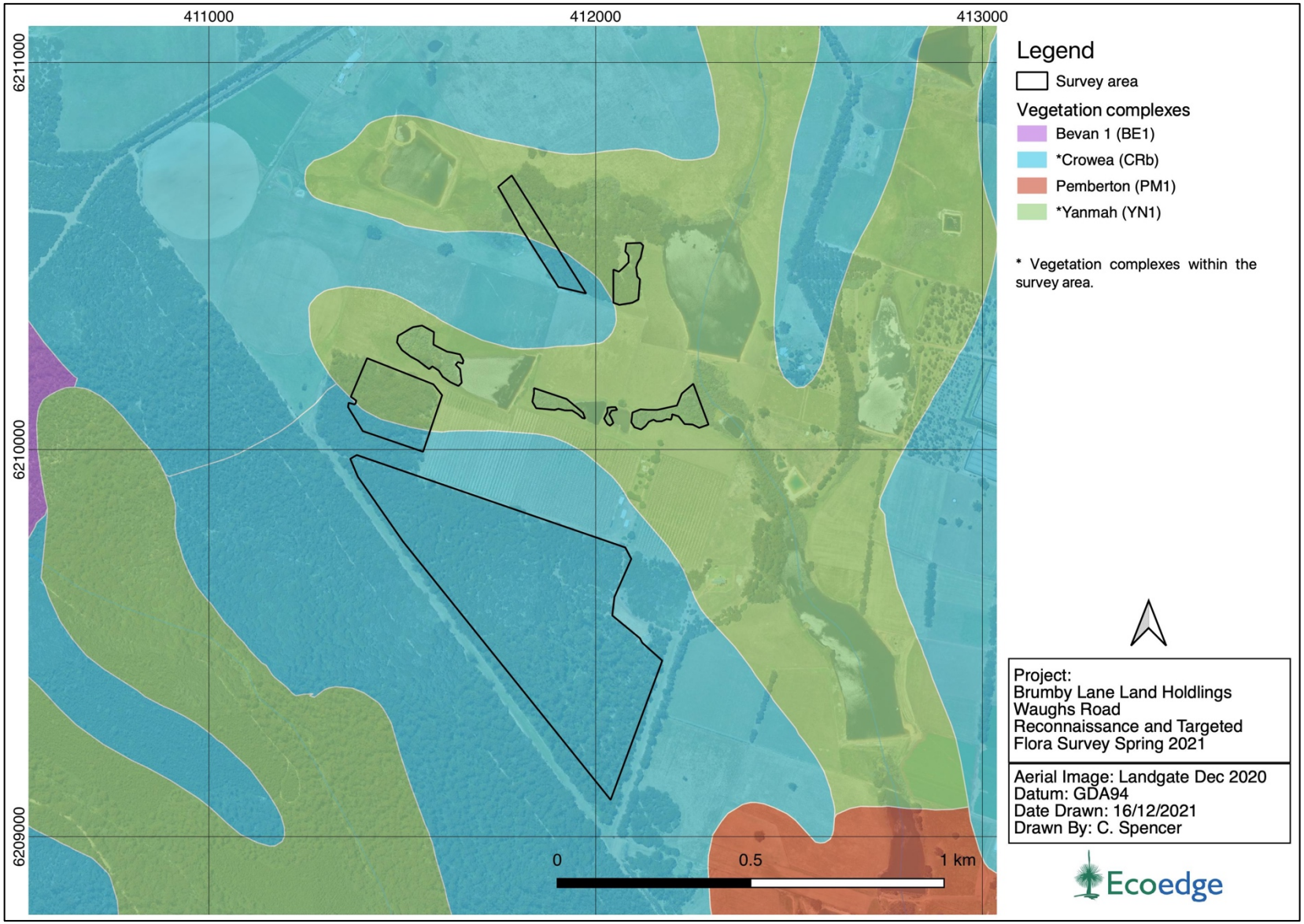

Figure 4. Vegetation complexes mapped in and nearby the survey area (Webb et al. 2016)

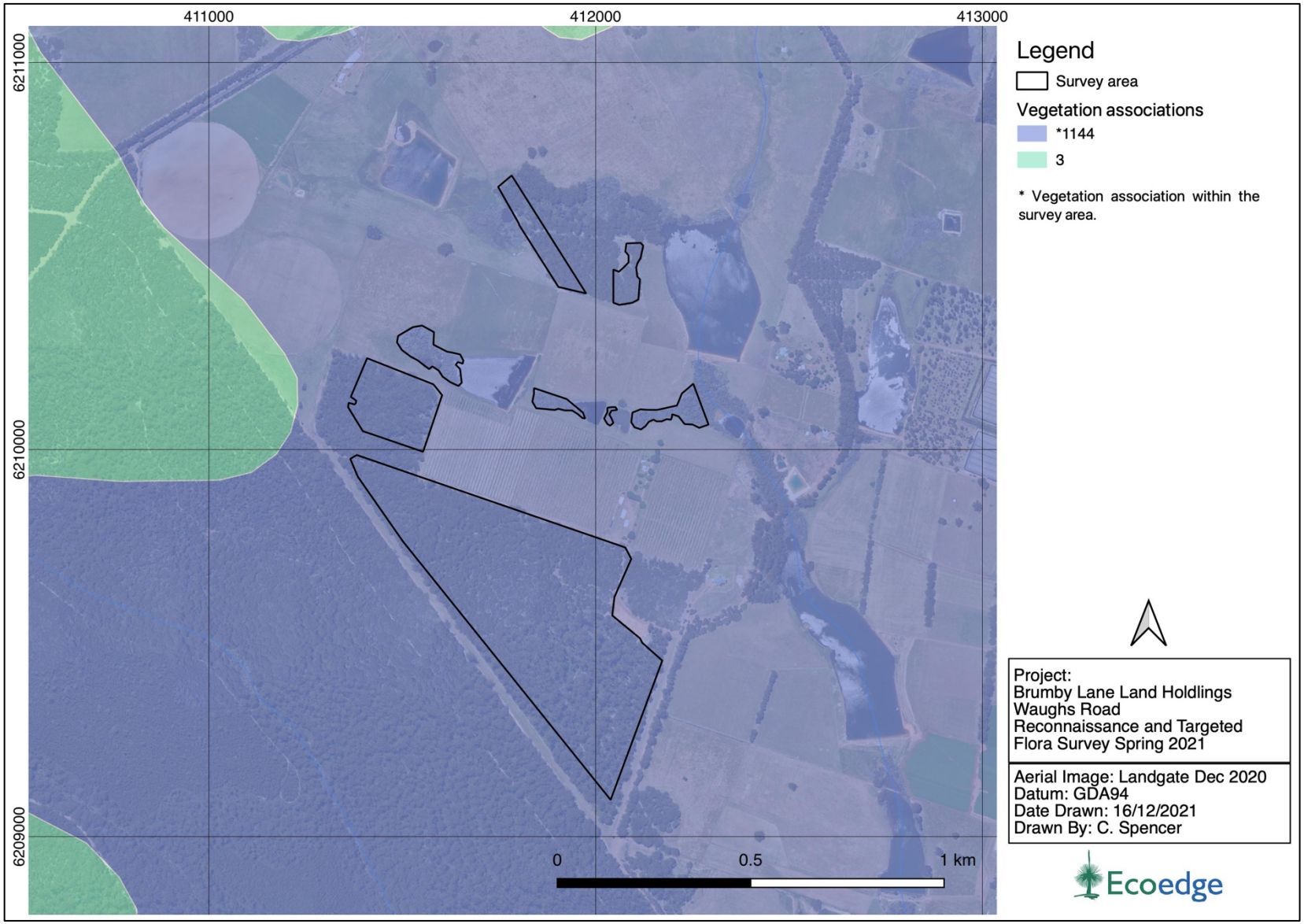

Figure 5. Vegetation associations mapped in and nearby the survey area.

4.3.3 Assessment of remaining extent against pre-European extent

In 2001, the Commonwealth of Australia stated national targets and objectives for biodiversity conservation, which recognised that the retention of 30%, or more, of the pre-clearing extent of each ecological community was necessary if Australia's biological diversity was to be protected (Environment Australia 2001).

In its report on the state-wide vegetation statistics incorporating the Comprehensive, Adequate and Representative (CAR) Reserve Analysis, the Government of Western Australia provides information on the pre-European and current extent of the ecological communities of Western Australia and reports on the status of the CAR reserve system for Western Australia (Government of Western Australia 2019a). This system is also based on the National retention targets of 30% overall. Only reserves managed by DBCA under the *Conservation and Land Management Act 1984* are considered for inclusion in the "CAR Reserve Analysis".

Table 5 presents the statistics as they relate to the percentage remaining of pre-European extent vegetation and the percentage of current extent in DBCA managed land of the two vegetation complexes identified within the survey area, the Crowea Complex (CRb), the Yanmah (YN1) Complex. These complexes exceed the 30% pre-European extent retention targets at a local (Shire of Manjimup), state government level and IBRA region (Warren) level.

Table 6 presents the same statistics for the Beard vegetation association; Association 1144 mapped across the survey area. Association 1144 also exceeds the 30% pre-European extent retention targets at the local and state government levels and the Warren IBRA region.

The red, orange and yellow shading in the tables indicates the status of the Commonwealth 30% retention target.

Status of the commonwealth retention target	>30%	<30%	<10%

Table 5. Vegetation complexes mapped within the survey area with regard to the Commonwealth retention targets (Government of Western Australia 2019a).

Vegetation Complex	Pre-European (ha)	Current Extent (ha)	% Remaining	% remaining in DBCA reserves
Crowea complex (CRb)				
South West	52,753.26	45,425.07	86.11	81.77
Shire of Manjimup	49,812.30	42,532.54	85.39	94.43
Yanmah (YN1)				
South West	23,494.22	19,229.71	81.85	77.38
Shire of Manjimup	11,748.88	8,258.27	70.29	50.01

* Excludes Crown Freehold Department Interest Lands that are managed under Section 8(a) of the CALM Act.

Table 6. Vegetation associations within the survey area with regard to the Commonwealth retention targets (Government of Western Australia 2019b).

Beard Vegetation association	Pre-European (ha)	Current Extent (ha)	% Remaining	% remaining in DBCA Managed Land*
Association 1144				
State-wide	160,314.84	128,066.79	79.88	73.91
IBRA region: Warren	159,668.36	127,836.26	80.06	74.09
Shire of Manjimup	150,788.36	118,932.99	78.87	72.60

* Excludes Crown Freehold Department Interest Lands managed under Section 8(a) of the CALM Act.

4.4 Threatened and Priority ecological communities

Ecological communities are defined by Western Australia's DBCA as "...naturally occurring biological assemblages that occur in a particular type of habitat. They are the sum of species within an ecosystem and, as a whole, they provide many of the processes which support specific ecosystems and provide ecological services." (DEC 2013).

Under Section 27 of the *Biodiversity Conservation Act 2016* (BC Act), the Western Australian Minister for Environment may list communities considered under significant threat as TECs. These TECs can be listed under one of three conservation categories: Critically Endangered (CE), Endangered (EN), Vulnerable (V). The BC Act also provides for listing communities as collapsed ecological communities.

Possible TECs that do not meet survey criteria may be added to the DBCA's PEC lists under Priorities 1, 2 or 3 (referred to as P1, P2, P3). Ecological communities that are adequately known, are rare but not Threatened, meet criteria for near Threatened, or that have been recently removed from the Threatened list, are placed in Priority 4 (P4). These ecological communities require regular monitoring. Conservation dependent ecological communities are placed in Priority 5 (P5) (DEC 2013).

The current listing of TECs and PECs is specified in DBCA (2018a, 2021a). The conservation categories for these TECs and PECs are defined in **Appendix 3**.

TECs can also be listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). There are three categories of TEC under the EPBC Act: Critically Endangered (CR), Endangered (EN) and Vulnerable (VU) (Department of Agriculture, Water and the Environment) (DAWE 2020a). These are defined in **Appendix 4.**

The desktop assessment of DBCA TEC PEC databases and a PMST query found no EPBC Act or BC Act listed TECs within 10 km of the survey area (DBCA 2021b, DAWE 2021). Two Priority listed communities were recorded within this radius. The nearest of these is the Priority 3 listed Epiphytic Cryptogams of the Karri_Forest located approximately 5.5 km south of the survey area. The two communities are described briefly in **Table 7,** with their occurrences mapped in **Figure 6.**

Table 7. Priority ecological communities occurring within ten km of the survey area (DAWE 2021, DBCA 2021b).

Community Description	Status (WA)	Status (EPBC Act)
Epiphytic Cryptogams of the Karri Forest Cryptogams associated with *Trymalium odoratissimum* subsp. *odoratissimum* and *Chorilaena quercifolia* in the karri forests of south-west Western Australia. Comprises liverworts, mosses and lichens found on the bark of mature plants (greater than 15 years old and prior to senescence at about age 50) of *Trymalium odoratissimum* subsp. *odoratissimum* and *Chorilaena quercifolia* in the karri forest of south-west Western Australia.	P3	N/A
Ridge Road Quartzite community Open Jarrah forest and woodland developed on young, exposed quartzite on Ridge Road	P1	N/A

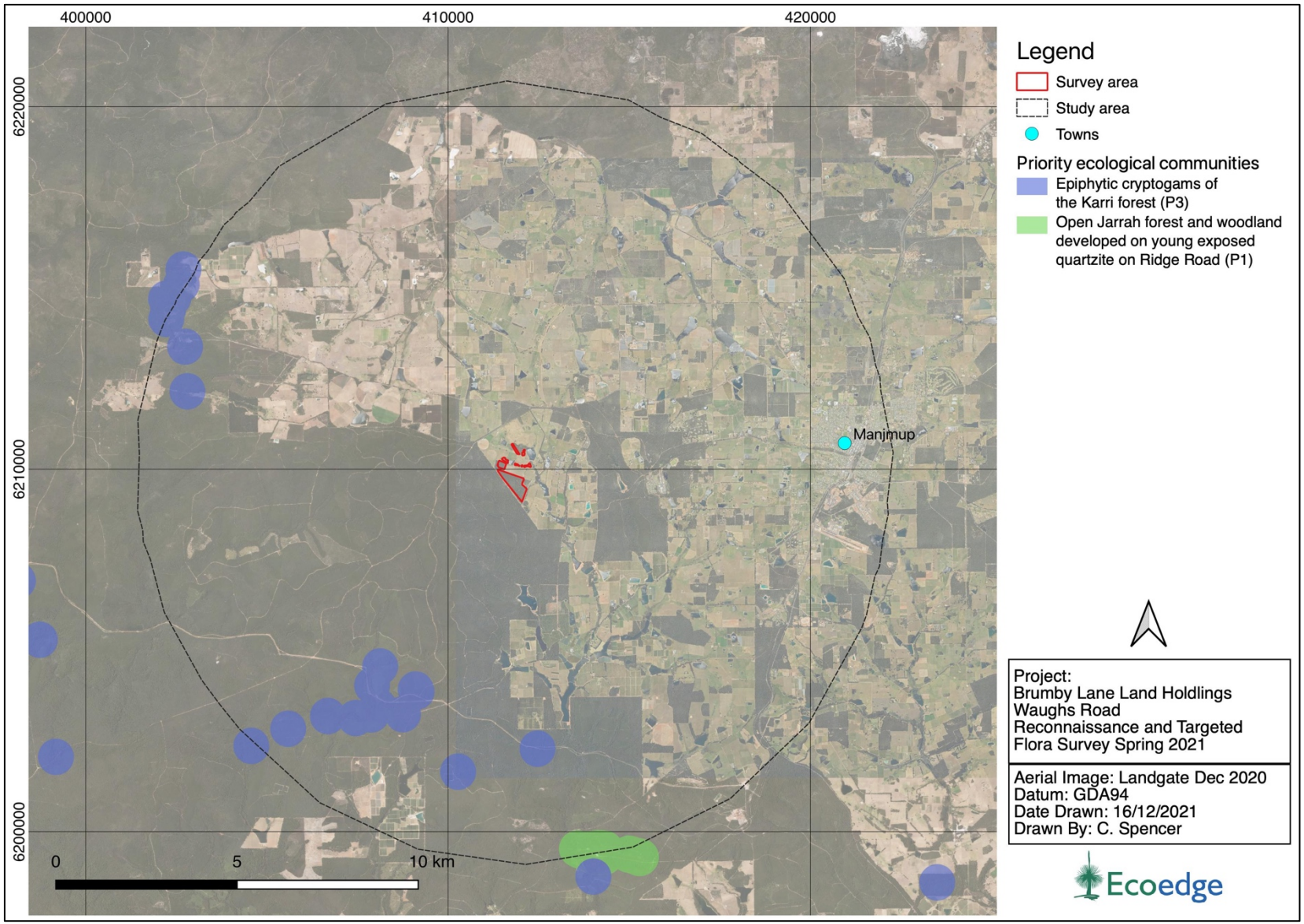

Figure 6. Priority ecological communities within a 10 km radius study area (DBCA 2020a).

4.5 Threatened and Priority flora

Species of flora and fauna are defined as having a Threatened or Priority conservation status where their extant populations are restricted geographically and/or under threat of possible extinction. The DBCA recognises these threats and consequently applies regulations towards population and species protection.

Threatened extant flora species are listed under Section 19 of the BC Act and are ranked according to their level of threat using the International Union for Conservation of Nature (IUCN) Red List categories and criteria of; Critically Endangered (CR), Endangered (EN), Vulnerable (VU). It is an offence to "take" or damage Threatened flora without Ministerial approval. Section 5 of the Act defines "to take" as "… to gather, pluck, cut, pull up, destroy, dig up, remove, harvest or damage flora by any means".

Priority flora is under consideration for future declaration as "Threatened flora", dependent on more information. Species classified as Priority One to Three (referred to as P1, P2 and P3) are in need of further survey to determine their status, while Priority Four (P4) species are adequately known rare or Threatened species that require regular monitoring.

Threatened flora lists are formally reviewed annually, whilst the Priority flora list is subject to a less formal ongoing review. The current listing of Threatened and Priority flora was updated on 5 December 2018 (DBCA 2018b).

Categories of Threatened and Priority flora as defined by the BC Act are presented in **Appendix 5** (DBCA 2019).

Threatened flora may also be protected under the EPBC Act and be listed in one of six categories; the definitions of these categories are summarised in **Appendix 6** (DAWE 2020a).

Threatened or Priority flora occurring within 10km of the survey area are provided in a likelihood of occurrence table in **Appendix 7.** The list has been generated from a NatureMap search (DBCA 2021c), a PMST query (DAWE 2021) (**Appendix 8**) and DBCA and WA Herbarium Threatened and Priority flora data downloads (DBCA 2021d).

Ten significant species were identified as occurring (DBCA 2021d) or potentially occurring DAWE 2021 within this search area. Seven of these were considered possible, and three unlikely to occur within the survey area. Two of the possible species are threatened orchids, *Caladenia christineae* and *Caladenia harringtoniae.* One of the possible occurrences was a species of fungi (*Amanita kalamundae)*, which is not a vascular plant.

There were no significant species recorded within the survey area (DBCA 2021d).

A breakdown of the likelihood of occurrence according to conservation status is provided in **Table 8**, with the complete assessment provided in **Appendix 7**. Known occurrences of Threatened and Priority flora are shown in **Figure 7**.

Table 8. Pre-survey likelihood of occurrence according to conservation status.

Likelihood of occurrence	Total no	Priority 1	Priority 2	Priority 3	Priority 4	Threatened
Likely	**0**	0	0	0	0	0
Possible	**7**	1	1	3	0	2
Unlikely	**3**	0	0	2	0	1
Total	**10**	**1**	**1**	**5**	**0**	**3**

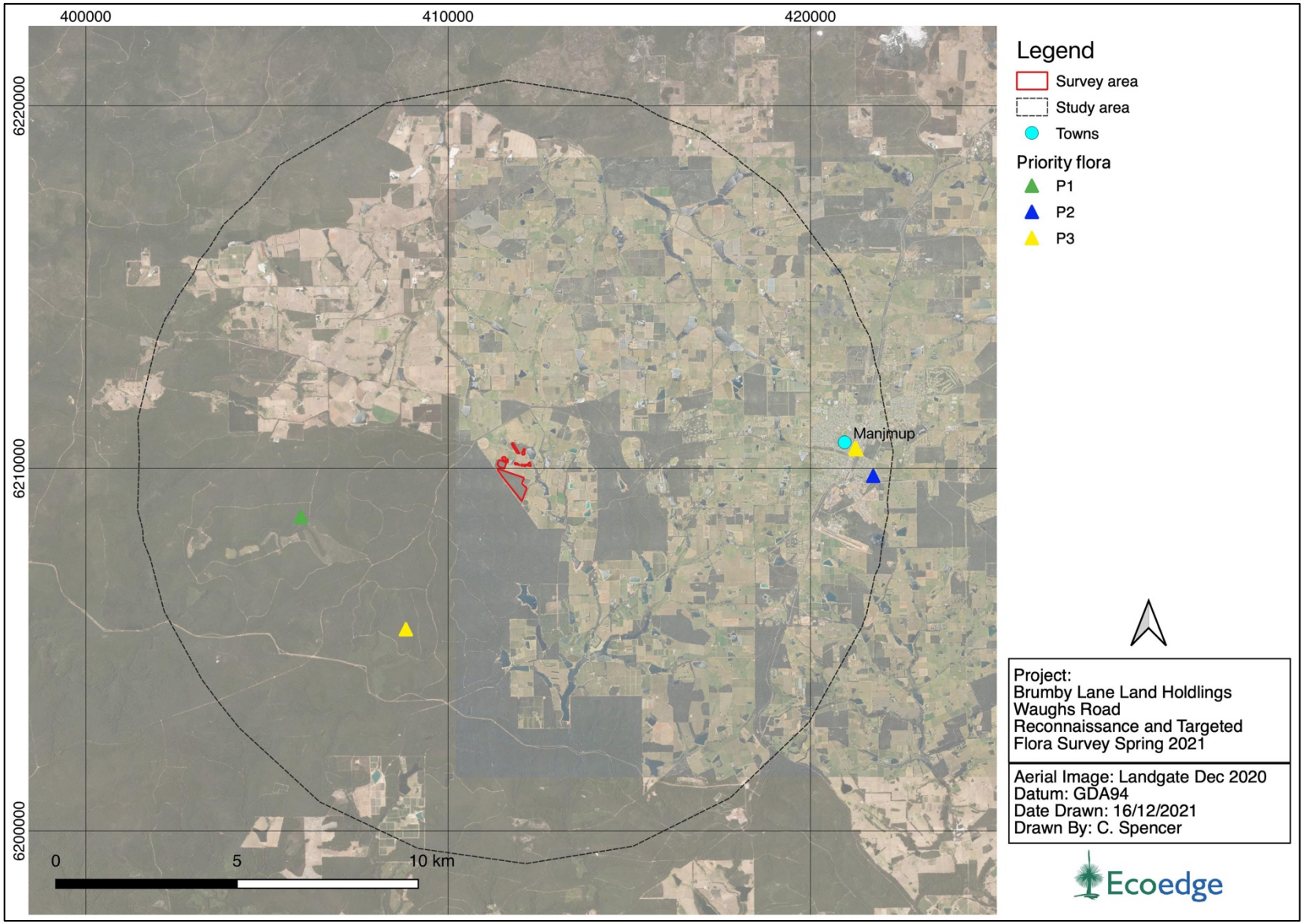

Figure 7. Threatened and Priority vascular and non-vascular flora within 10 km of the survey area (DBCA 2021d).

4.6 Wetlands and watercourses

The survey area occurs within the catchment of the Lefroy Brook (Beckwith Environmental Planning 2007). Two un-named tributaries of the brook are mapped to pass generally north-south to the east and west of the survey area (Crossman & Li 2015). The closest of these passes about 30 m to the east of the survey area. Aerial photography shows a series of dams immediately adjacent to the survey areas which are linked by a drainage line that connects to the eastern tributary.

The occurrence of the un-named tributaries and dams in proximity to the survey area is shown in **Figure 8**.

Geomorphic wetlands have not been formally mapped or recorded within proximity to the survey area, according to the Available Wetland Mapping in WA dataset (DBCA 2021e). The nearest mapped wetland is approximately 24 km southwest of the survey area (DBCA 2017).

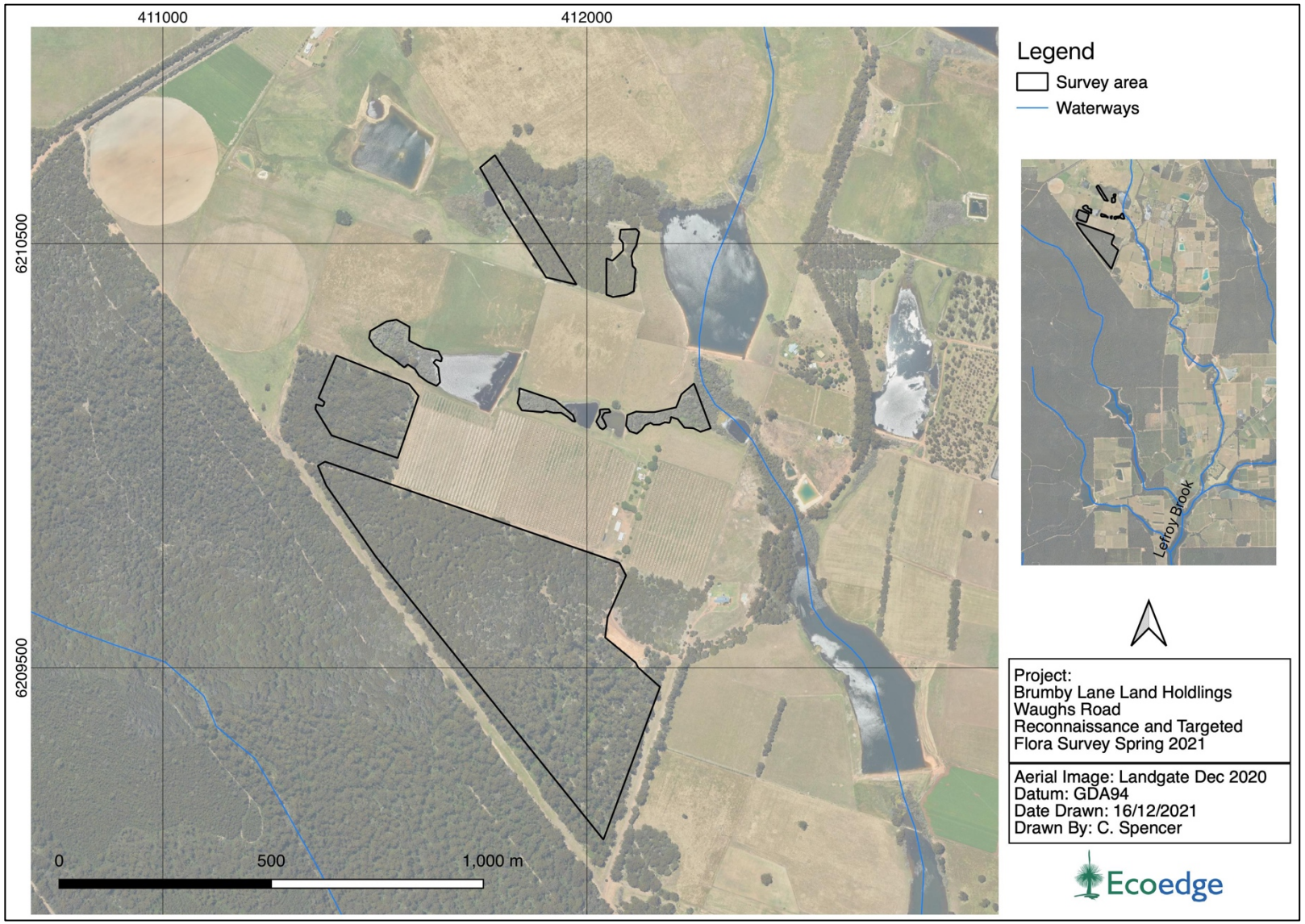

Figure 8. Waterways in proximity to the survey area.

4.7 Regional ecological linkages

Regional ecological linkages "link protected patches of regional significance by retaining the best (condition) patches available as stepping-stones for flora and fauna between regionally significant areas" (Molloy et al. 2009).

Regional ecological linkages have been mapped by Molloy et al. (2009) across the SW of Western Australia in an area spanning between just north of Mandurah to Walpole in the south-east.

Molloy et al. (2009) assessed and assigned "proximity value" (pv) ratings to all patches of remnant native vegetation as a way of indicating the value of their connectivity with regional ecological linkages. This was based on their distance from the nearest mapped regional ecological linkage axis line and connected parcels of remnant vegetation (**Table 9**).

Table 9. Linkage proximity rating values assigned to patches of remnant vegetation within a landscape (from Molloy et al. 2009).

Proximity value	Description	
1a	with an edge touching or	< 100 m from a linkage
1b	with an edge touching or	< 100m from a natural area selected in 1a
1c	with an edge touching or	< 100m from a natural area selected in 1b
2a	with an edge touching or	< 500m from a linkage
2b	with an edge touching or	< 500 m from a natural area selected in 2a
2c	with an edge touching or	< 500 m from a natural area selected in 2b
3a	with an edge touching or	< 1000m from a linkage
3b	with an edge touching or	< 1000m from a natural area selected in 3a
3c	with an edge touching or	< 1000m from a natural area selected in 3b
From Malloy et al. 2009		

Almost all of the vegetation within the survey area has been assigned a pv rating due to its proximity with vegetation linked to a mapped regional ecological linkage associated with uncleared vegetation within the DBCA managed State Forest. The two blocks in the southern half of the site have been assigned the highest 1a proximity rating as vegetation within these areas is contiguous with linkage. The balance of the vegetation has been assigned 1b and 2c pv ratings (**Figure 9**).

4.8 Environmentally sensitive areas

Environmentally sensitive areas (ESAs) are protected under the Environmental Protection (Clearing of Native Vegetation) Regulations 2004. They are selected for their environmental values at State or National levels (Government of Western Australia 2005). They include:

- Defined wetlands and riparian vegetation within 50 m
- Areas covered by TECs
- Areas of vegetation within 50 m of Threatened flora
- Bush Forever sites
- Declared World Heritage property sites.

There are no ESAs located within the survey area. There is, however, an ESA located 75 m southwest of the survey area along the length of its southwest boundary (**Figure 10**).

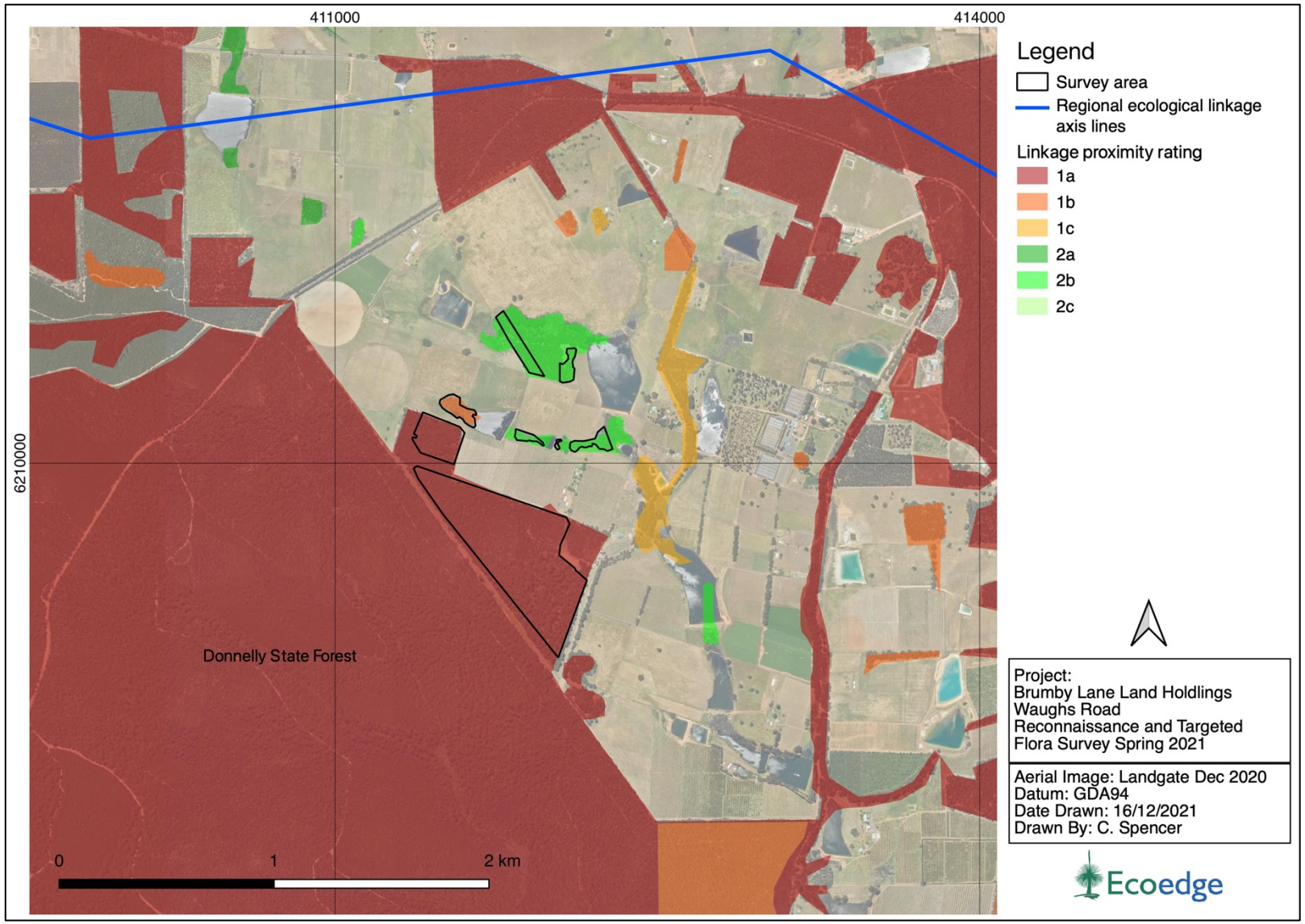

Figure 9. Regional ecological linkages in the study area (Molloy et al. 2009).

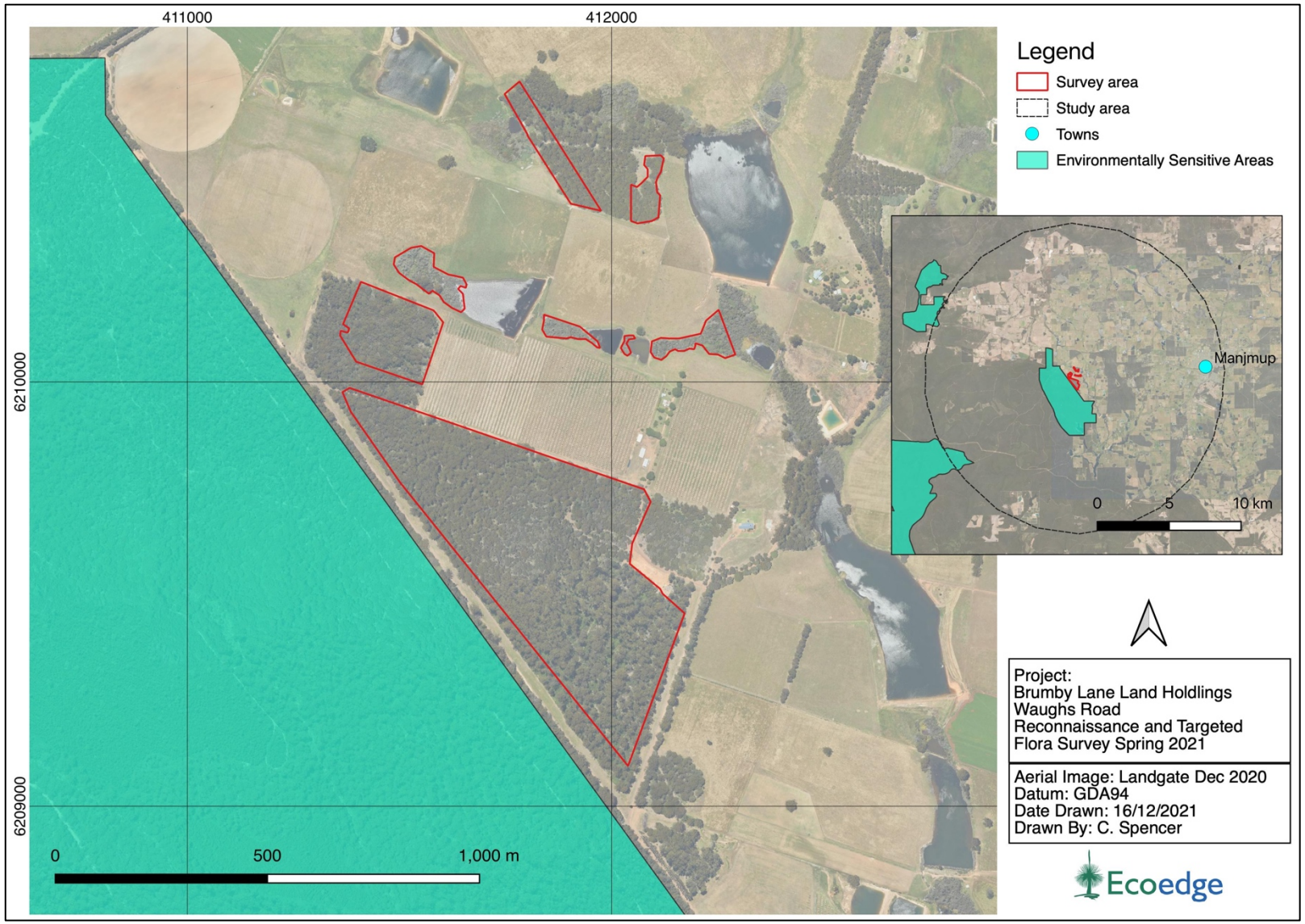

Figure 10. ESAs in proximity to the survey area (DWER 2020).

5 Field survey results

A map showing the location of data collection points (vegetation condition assessment points and relevés) and survey track files is provided in **Appendix 8.**

5.1 Flora

One hundred and sixteen vascular flora taxa were identified within the survey area, of which twenty-eight were introduced species (**Appendix 10**). The two plant families with the highest representation, with eleven species each, were the Fabaceae and Poaceae. All but one of the Fabaceae were native, while all except one taxon of Poaceae were non-native.

No flora listed as Threatened under the EPBC Act or the BC Act were found within the survey area. In addition, no Priority flora or other flora of conservation significance (including non-vascular flora) were found.

The post-survey likelihood of occurrence of the seven potential significant vascular flora, including Threatened flora, was "unlikely", except for a P1 grass, *Deyeuxia inaequalis*, which was assigned a post-survey likelihood of "possible". *Deyeuxia inaequalis* does not flower till summer, and it is relatively non-descript when not flowering, so the survey was probably too early to have found this species if it was present.

A summary of the post-survey likelihood of occurrence according to conservation status is provided in **Table 10.**

Table 10. Vascular post-survey likelihood of occurrence according to conservation status.

Likelihood of occurrence	Total No.	Priority 1	Priority 2	Priority 3	Priority 4	Threatened
Possible	**1**	1				
Unlikely	**9**		1	5		3
Total	**10**	**1**	**1**	**5**		**3**

5.2 Significant weeds

Rubus anglocandicans (blackberry), which was very common in the creeklines (wetlands), is a Declared Pest (s22(2)) under the *Biosecurity and Agriculture Management Act 2007*. It is in the C3, exempt category. There were no Weeds of National Significance.

5.3 Vegetation units

Four vegetation units were identified within the survey area and are described below and shown in **Figure 11** to **Figure 14.** Vegetation unit A is the most extensive type, covering about 80% of the survey area.

Figure 11. Vegetation unit A.

Vegetation Unit A. *Eucalyptus diversicolor*, *E. marginata*, *Corymbia calophylla* tall open forest over *Banksia grandis* isolated low woodland over *Bossiaea aquifolium*, *Taxandria parviceps*, *Trymalium odoratissimum* tall shrubland over *Hibbertia cuneiformis*, *Hovea elliptica*, *Leucopogon verticillatus*, *Pimelea clavata*, *Podocarpus drouynianus* medium shrubland over *Clematis pubescens*, *Hibbertia amplexicaulis*, *Macrozamia riedlei*, *Tremandra stelligera* open low shrubland and scattered forbs including *Pteridium esculentum*, *Cryptostylis ovata*, *Lomandra pauciflora*, *Patersonia umbrosa* on grey-brown sandy loam or (gravelly) yellow-brown clay loam. (*E. marginata* and *C. calophylla* are sometimes absent from this unit).

Figure 12. Vegetation unit B.

Vegetation Unit B. *Eucalyptus marginata*, *Corymbia calophylla*, medium open forest over *Banksia grandis*, scattered low trees over *Bossiaea aquifolium*, *B. linophylla*, *Hibbertia cuneiformis* tall shrubland over *Leucopogon verticillatus*, *Pimelea clavata*, *Podocarpus drouynianus*, *Tremandra stelligera*, *Xanthorrhoea gracilis* medium/low shrubland and scattered *Tetrarrhena laevis* grass on gravelly grey-brown sandy loam.

Figure 13. Vegetation unit C1.

Vegetation unit C1. *Eucalyptus diversicolor* tall open forest (over *Callistachys lanceolata* low woodland) over *Trymalium odoratissimum*, *Taxandria linearifolia* open tall shrubland over *Lepidosperma effusum*, (*L. tetraquetrum*) closed sedgeland on grey-brown clay-loam.

Figure 14. Vegetation unit C2.

Vegetation Unit C2. *Melaleuca preissiana* or *Taxandria linearifolia* low woodland/low open forest over (*Melaleuca microphylla*), **Rubus anglocandicans* open-closed medium shrubland, with *Lepidosperma tetraquetrum* tall open sedgeland on grey-brown clay loam. (In places **R. anglocandicans* is dominant and probably covers previous pasture areas within this community).

The extent and proportion of the total vegetated areas of each of these vegetation units are presented in **Table 11** and shown in **Figure 15**.

Table 11. Vegetation units by area and condition rating in the survey area.

Unit	Condition	Area (ha)	%
A	Excellent	23.16	80.4
	Very Good	4.41	15.3
	Good	0.08	0.3
	Degraded	0.43	1.5
	Completely Degraded	0.74	2.6
	Total	**28.81**	**100.0**
B	Very Good	3.18	73.4
	Good	1.16	26.6
	Total	**4.34**	**100.0**
C1	Very Good	0.28	54.2
	Degraded	0.23	45.8
	Total	**0.51**	**100.0**
C2	Very Good	0.61	24.6
	Good	0.14	5.5
	Degraded	1.14	46.4
	Completely Degraded	0.58	23.5
	Total	**2.47**	**100.0**
	Cleared	0.60	
	Grand Total	**36.73**	

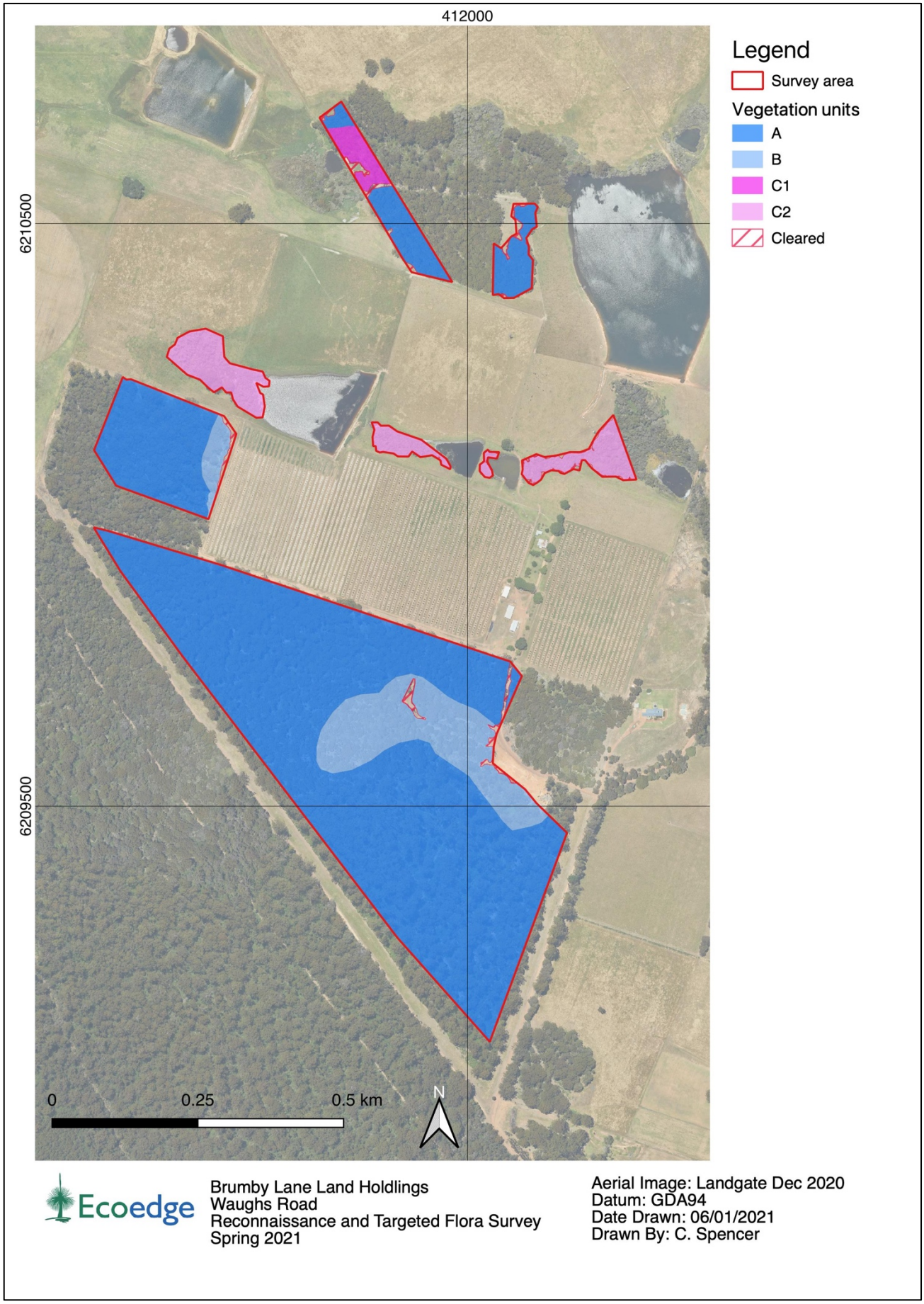

Figure 15. Vegetation units mapped within the survey area.

5.4 Vegetation condition

The bulk of the survey area vegetation (87%) was in Very Good or Excellent condition. This Very Good or Excellent condition vegetation is mainly located within the large block of vegetation in the southern part of the survey area adjacent to DBCA managed State Forest.

There has been some fairly recent logging within vegetation units A and B with associated physical disturbance, including the construction of access tracks.

The vegetation in the wetland or creekline areas has been subject to physical disturbance in the past, including partial clearing and ongoing livestock grazing.

A breakdown of the condition of vegetation within the survey area is provided in **Table 12.** and shown in **Figure 16**.

Table 12. Area and percentage of the survey area in vegetation condition classes.

Condition	Area (ha)	%
Excellent	23.16	64.12
Very Good	8.47	23.45
Good	1.37	3.80
Degraded	1.80	4.99
Completely Degraded	1.32	3.65
Total Native veg.	36.13	100.00
Cleared	0.60	
Total Survey Area	36.73	

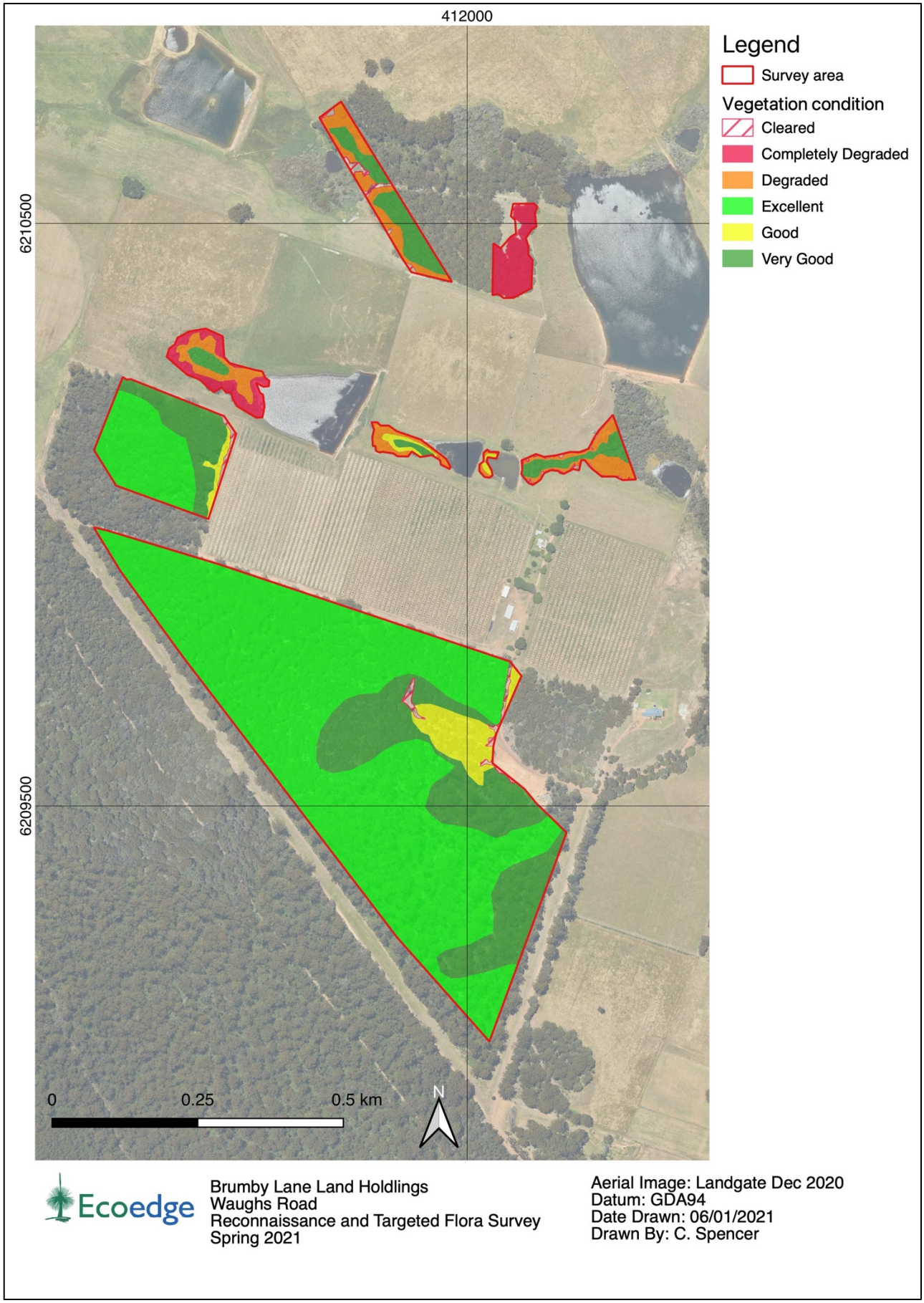

Figure 16. Vegetation condition within the survey area.

6 Discussion and conclusions

6.1 Significance of flora

No Flora listed as Threatened under the EPBC Act or the BC Act were found within the survey area. In addition, no Priority flora or other flora of conservation significance were found in the survey area.

6.2 Significance of vegetation

None of the vegetation units resembled a TEC or PEC or were part of any restricted vegetation type. Both vegetation units A and B appear to be typical of karri and jarrah-marri forest types of the high rainfall south-west south, and south-west of Manjimup.

Vegetation unit A shares species characteristic of several of the karri community types that belong to community group 3 described by Inions et al. (1990). This community group occurs in the drier northern half of the karri forest zone as studied by Inions et al. Vegetation unit B is closest to site-type K of the classification of the southern jarrah forest by Strelein (1988), which occurs on gravelly sandy loams in moderately to steeply dissected landscape south of Manjimup.

The PEC 'Epiphytic cryptogams of the Karri Forest', which can occur in older or long-unburnt karri stands, was searched for during the survey but was not observed.

6.3 Vegetation complexes and associations

Two vegetation complexes are mapped to occur across the survey area, the Crowea Complex (CRb) and the Yanmah Complex (YN1). The Crowea Complex makes up the greatest proportion of the survey area by area. The survey area vegetation is characteristic of these complexes in terms of dominant species and structure, and all have more than 30% of their pre-European extent of native vegetation remaining.

One of Beard's vegetation associations, Association 1144, is mapped across the survey area. The survey area vegetation also meets the broadly described characteristic of this association in terms of dominant species and structure, and more than 30% of its pre-European extent of native vegetation remains.

6.4 Wetland and riparian habitat

Vegetation units C1 and C2 comprise riparian habitat, being situated along ephemeral streams that have been extensively dammed for water storage. Whereas just over half of unit C1 was in Very Good condition, two-thirds of unit C2 was in Degraded or Completely Degraded condition. Unit C2 especially had been heavily invaded by blackberry, and the effects of current grazing by cattle was apparent around the edges of the patches comprised of this vegetation unit.

6.5 Regional ecological linkages

Almost all the vegetation within the survey area forms part of a mapped ecological linkage associated with uncleared vegetation within the DBCA managed State Forest (Molloy et al. 2009). Vegetated portions within the southern half of the area have been assigned the highest 1a proximity value as they are contiguous with vegetation associated with this linkage.

There is no statutory basis for the protection of these regional ecological linkages. However, the importance of ecological linkages, in general, has been recognised as an environmental policy consideration in EPA and Planning policy over the last decade (EPA 2008 and references therein).

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Appendix

Appendix 1. Threatened and Priority flora likelihood of occurrence assessment rationale.

Rating	Presurvey rationale	Post survey rationale
Recorded		Taxon was or has been recorded in the survey area.
Likely	Known to occur within one kilometres of the survey area with suitable habitat known or predicted to occur within the survey area.	The taxon is known to occur within the survey area 1 km of the survey area and very suitable habitat was observed but the taxon was not observed for either of the following reasons. • The taxon was dormant at time of survey and could therefore not be located. • The habitat was compromised, for example due to a recent fire. • The survey area is challenging to survey and the taxon is non- descript and difficult to find for example, in large areas of rocky granite outcrops, or occurs within an expanse of a water body.
Possible	Known to occur within 10 km of the survey area with suitable habitat known or predicted to occur within the survey area.	The taxon is known from within a 10 km radius of the survey area and suitable habitat for the species was observed, but despite a thorough search being carried out the species was not observed. The taxon may however be present for any of the following reasons. • The taxon was dormant at time of survey and could therefore not be located. • The habitat was compromised for example, due to a recent fire. • The survey area is challenging to survey and the taxon is non- descript and difficult to find for example, in large areas of rocky granite outcrops, or occurs within an expanse of a water body.
Unlikely	Known or predicted to occur within 10 km but no suitable habitat is known or predicted to occur within the survey area.	A thorough search for the taxon was undertaken but the taxon was not found and is unlikely to be present for one or more of the following reasons: • No suitable habitat was observed, and the taxon is known to be restricted to a narrow and clearly defined habitat type • Suitable habitat present, but the survey area is easy to survey, and the taxon is easy to identify and observe and find in the field. • Potentially suitable habitat was found to be too degraded to support the taxon.

Appendix 2. Vegetation condition scale (EPA 2016).

Vegetation Condition	South West and Interzone Botanical Provinces
Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.
Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.

Appendix 3. Categories of Threatened Ecological Communities under the EPBC Act.

Category	Definition
Critically endangered (CE)	If, at that time, an ecological community is facing an extremely high risk of extinction in the wild in the immediate future (indicative timeframe being the next 10 years).
Endangered (E)	If, at that time, an ecological community is not critically endangered but is facing a very high risk of extinction in the wild in the near future (indicative timeframe being the next 20 years).
Vulnerable (V)	If, at that time, an ecological, community is not critically endangered or endangered but is facing a high risk of extinction in the wild in the medium–term future (indicative timeframe being the next 50 years).

Appendix 4. Categories of threatened and priority ecological communities under the BC Act.

Conservation code	Category
(T) Threatened ecological community pursuant to Sect 27 of the *Biodiversity Conservation Act 2016.*	
T	(T) CR – Critically endangered An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.
	(T) EN - Endangered An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.
	(T) VU - Vulnerable An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.
(P) Priority species – possible threatened communities.	
P1	Poorly known communities Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤ 100ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.

Conservation code	Category
P2	Poorly known communities Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200ha). At least some occurrences are not believed to be under immediate threat (within approximately 10 years) of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
P3	Poorly known communities a) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: b) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately 10 years), or; c) communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change etc. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.
P4	Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring. a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
P5	Conservation dependent ecological communities Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Appendix 5. Definitions of conservation codes for Threatened and Priority flora.

Conservation code	Category
(T) Threatened species pursuant to Sect 19 of the BC Act 2016.	
T	(T) CR – Critically endangered Threatened species considered to be "*facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines*".
	(T) EN - Endangered Threatened species considered to be "*facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines*".
	(T) VU - Vulnerable Threatened species considered to be "*facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines*".
(P) Priority species – possible Threatened species.	
P1	Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
P2	Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

Conservation code	Category
P3	Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
P4	(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Appendix 6. Categories of Threatened species under the EPBC Act.

Category	Definition
Extinct (Ex)	A native species is eligible to be included in the ***extinct*** category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
Extinct in the Wild (ExW)	A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered (CE)	A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered (EN)	A native species is eligible to be included in the endangered category at a particular time if, at that time (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable (VU)	A native species is eligible to be included in the vulnerable category at a particular time if, at that time (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.
Conservation Dependent (CD)	A native species is eligible to be included in the conservation dependent category at a particular time if, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

Appendix 7. Likelihood of occurrence of species within survey area.

Species	Category	Flowering	Description and habitat	Likelihood	Post survey assessment	Post Survey Likelihood
Caladenia christineae	T (VU)	Sep-Nov	Tuberous, perennial, herb, 0.25-0.4 m high. Fl. white-cream-yellow. Sand, clayey loam, laterite. Margins of winter-wet flats, swamps, & freshwater lakes.	Possible	Potentially suitable habitat was found to be too degraded to support the taxon	Unlikely
Caladenia harringtoniae	T (VU)	Oct-Nov	Tuberous, perennial, herb, 0.2-0.4 m high. Fl. pink. Sandy loam. Winter-wet flats, margins of lakes, creeklines, granite outcrops.	Possible	Potentially suitable habitat was found to be too degraded to support the taxon	Unlikely
Drakaea micrantha	T (VU)	Sep-Oct	Tuberous, perennial, dwarf hammer orchid, 0.15–0.3 m high. Fl. red, yellow. Small heart shaped leaf with green veins. White-grey infertile sand in *Eucalyptus marginata, Allocasuarina fraseriana* woodland or forest. Often under *Kunzea ericifolia, K. glabrescens* with *Paracaleana nigrita* and other Drakaea species.	Unlikely	Unsuitable habitat	Unlikely
Deyeuxia inaequalis	P1	Summer	Erect, tufted annual, grass-like or herb, 0.75 m high. Loam.	Possible	Suitable habitat; The survey area is challenging to survey, being very dense in places, and the taxon is non- descript and difficult to find	Possible
Caladenia erythrochila	P2	Sep-Oct	Tuberous, perennial, herb, 0.2-0.25 m high. Fl. red-brown-purple. Grey sand over laterite. Well-drained lateritic soils under scattered jarrah.	Possible	Unsuitable habitat	Unlikely

Species	Category	Flowering	Description and habitat	Likelihood	Post survey assessment	Post Survey Likelihood
Amanita kalamundae	P3	May to Jun	Pileus 40-50 mm, pale buff to clay pink to pale vinaceous buff, margin appendiculate, non-sulcate, context white, smell of mustard. Universal veil on pileus: white or pale buff, breaking into large or small patches, fugacious. Jarrah forest near woody plants.	Possible	Unsuitable habitat; too degraded	Unlikely
Calytrix pulchella	P3	Aug-Nov	Shrub, 0.3-0.7(-1) m high. Fl. pink. Grey or white sand over laterite. Ridges, flats.	Unlikely	Unsuitable habitat; too degraded	Unlikely
Chamelaucium forrestii (sp. Mt Frankland)	P3	Jul to Nov	Shrub, erect, up to 2 m high. Fl. Cream, tinged with green. The species grows on granitic monadnocks in high rainfall jarrah and karri forest.	Unlikely	Unsuitable habitat	Unlikely
Pultenaea pinifolia	P3	Oct-Nov	Erect, slender shrub, 1-3 m high. Fl. yellow, orange. Loam or clay. Floodplains, swampy areas.	Possible	Unsuitable habitat; too degraded	Unlikely
Stylidium roseonanum	P3	Oct	Diminutive, short-lived annual, herb, 0.015-0.03 m high. Fl. red-white. Swamps.	Possible	Unsuitable habitat; too degraded	Unlikely

Appendix 7. Protected Matters Search Tool and NatureMap reports.

NatureMap
Mapping Western Australia's biodiversity

Waughs Road, Glenoran NatureMap Sig Flora Report 23/10/21_10km

Created By Guest user on 23/10/2021

Kingdom	Plantae
Conservation Status	Conservation Taxon (T, X, IA, S, P1-P5)
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	116° 02' 42" E,34° 14' 42" S
Buffer	10km

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1.	13617	*Caladenia christineae*		T	
2.	18504	*Caladenia erythrochila*		P2	
3.	5474	*Calytrix pulchella*		P3	
4.	36040	*Chamelaucium sp. Mt Frankland (A.S. George 11117)*		P3	
5.	298	*Deyeuxia inaequalis*		P1	
6.	4179	*Pultenaea pinifolia*		P3	
7.	7791	*Stylidium roseonanum*		P3	

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

Australian Government

Department of Agriculture, Water and the Environment

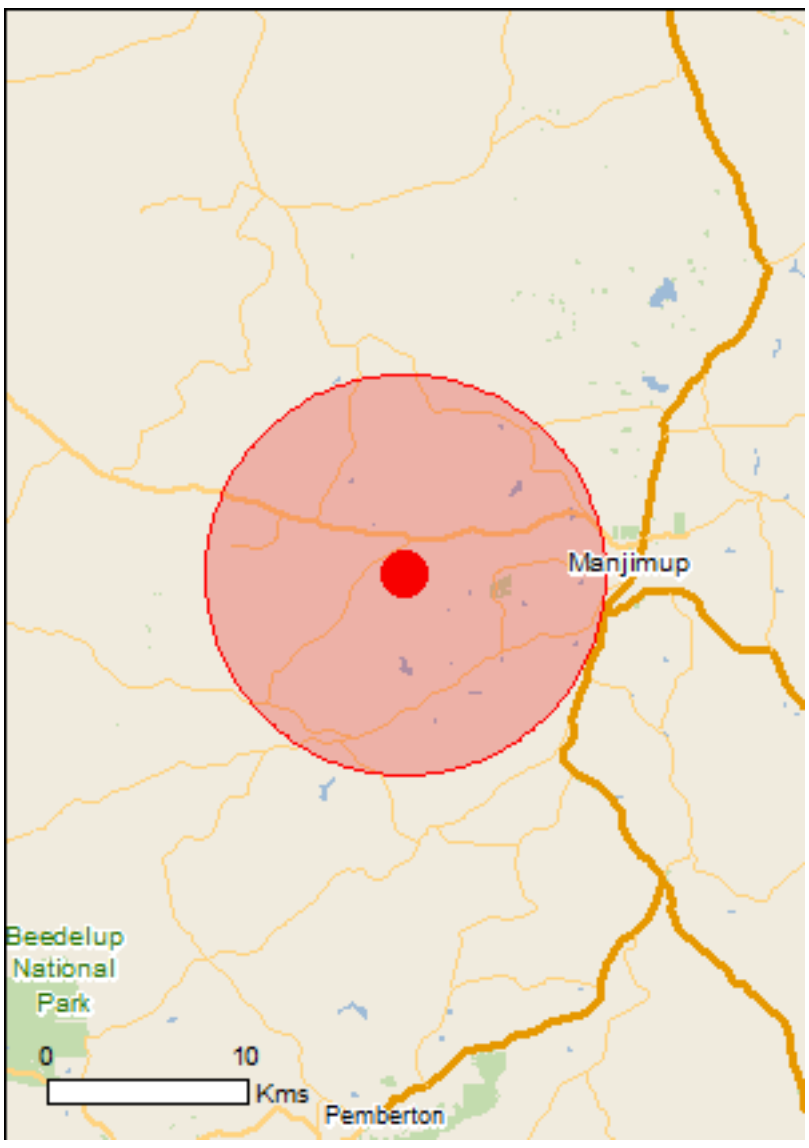
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

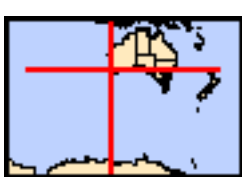
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 23/10/21 13:33:37



Coordinates

Buffer: 10.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	15
Listed Migratory Species:	8

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	11
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	1
Regional Forest Agreements:	1
Invasive Species:	23
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
Calyptorhynchus baudinii Baudin's Cockatoo, Long-billed Black-Cockatoo [769]	Endangered	Breeding known to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Breeding likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Fish		
Galaxiella nigrostriata Blackstriped Dwarf Galaxias, Black-stripe Minnow [88677]	Endangered	Species or species habitat known to occur within area
Nannatherina balstoni Balston's Pygmy Perch [66698]	Vulnerable	Species or species habitat may occur within area
Mammals		
Bettongia penicillata ogilbyi Woylie [66844]	Endangered	Species or species habitat known to occur within area
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat known to occur within area
Setonix brachyurus Quokka [229]	Vulnerable	Species or species habitat known to occur within area
Other		

Name	Status	Type of Presence
[Westralunio carteri](#)		
Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat likely to occur within area
Plants		
[Caladenia harringtoniae](#)		
Harrington's Spider-orchid, Pink Spider-orchid [56786]	Vulnerable	Species or species habitat likely to occur within area
[Drakaea micrantha](#)		
Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
[Apus pacificus](#)		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
[Motacilla cinerea](#)		
Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
[Actitis hypoleucos](#)		
Common Sandpiper [59309]		Species or species habitat likely to occur within area
[Calidris acuminata](#)		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
[Calidris ferruginea](#)		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
[Calidris melanotos](#)		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
[Numenius madagascariensis](#)		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
[Pandion haliaetus](#)		
Osprey [952]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
[Actitis hypoleucos](#)		
Common Sandpiper [59309]		Species or species

Name	Threatened	Type of Presence
		habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Faunadale	WA

Regional Forest Agreements	[Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
South West WA RFA	Western Australia

Invasive Species	[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		

Name	Status	Type of Presence
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom		Species or species habitat likely to occur

Name	Status	Type of Presence
[20126]		within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-34.245 116.045

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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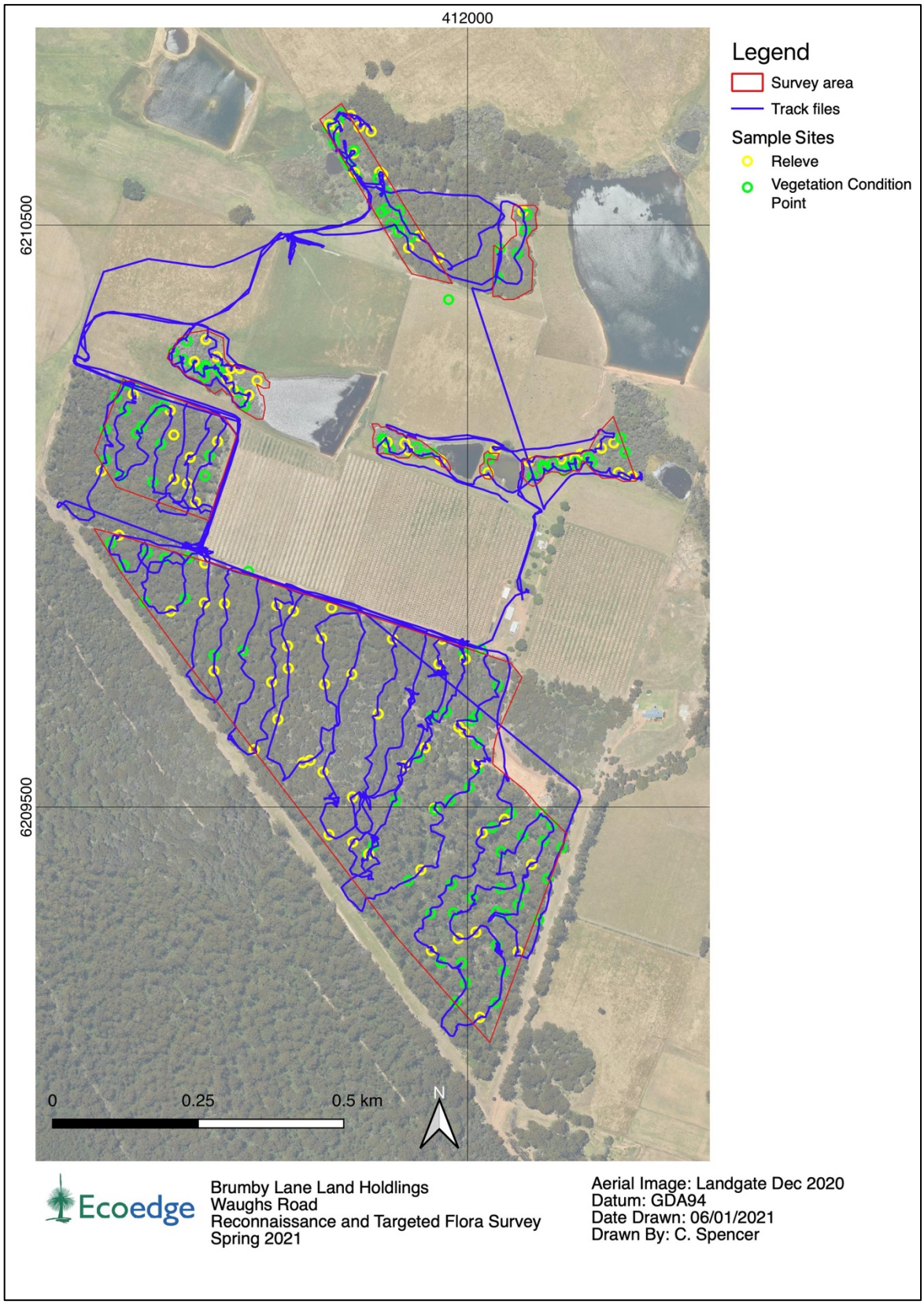
Appendix 9. Survey area sample sites.



Appendix 10. List of vascular flora found within the survey area.

Number	Family name	Species name	Naturalised
1	Apiaceae	*Daucus glochidiatus*	
2	Apiaceae	*Xanthosia candida*	
3	Asparagaceae	*Lomandra integra*	
4	Asparagaceae	*Lomandra pauciflora*	
5	Asteraceae	*Arctotheca calendula*	*
6	Asteraceae	*Cirsium vulgare*	*
7	Asteraceae	*Hypochaeris glabra*	*
8	Asteraceae	*Lagenophora huegelii*	
9	Asteraceae	*Senecio diaschides*	
10	Asteraceae	*Sonchus asper*	*
11	Asteraceae	*Sonchus hydrophilus*	
12	Caryophyllaceae	*Cerastium glomeratum*	*
13	Caryophyllaceae	*Petrorhagia dubia*	*
14	Caryophyllaceae	*Silene gallica*	*
15	Casuarinaceae	*Allocasuarina decussata*	
16	Celastraceae	*Stackhousia monogyna*	
17	Centrolepidaceae	*Centrolepis aristata*	
18	Centrolepidaceae	*Centrolepis drummondiana*	
19	Cyatheaceae	*Sphaeropteris cooperi*	*
20	Cyperaceae	*Isolepis cernua* var. *cernua*	
21	Cyperaceae	*Isolepis cyperoides*	
22	Cyperaceae	*Isolepis prolifera*	*
23	Cyperaceae	*Lepidosperma effusum*	
24	Cyperaceae	*Lepidosperma tetraquetrum*	
25	Cyperaceae	*Netrostylis* sp. Jarrah Forest (R. Davis 7391)	
26	Cyperaceae	Unidentified sedge	
27	Dennstaedtiaceae	*Pteridium esculentum*	
28	Dilleniaceae	*Hibbertia amplexicaulis*	
29	Dilleniaceae	*Hibbertia commutata*	
30	Dilleniaceae	*Hibbertia cuneiformis*	
31	Dilleniaceae	*Hibbertia cunninghamii*	
32	Dilleniaceae	*Hibbertia inconspicua*	
33	Droseraceae	*Drosera glanduligera*	
34	Droseraceae	*Drosera pallida*	
35	Elaeocarpaceae	*Tremandra diffusa*	
36	Elaeocarpaceae	*Tremandra stelligera*	
37	Ericaceae	*Leucopogon capitellatus*	
38	Ericaceae	*Leucopogon verticillatus*	
39	Ericaceae	*Styphelia propinqua*	
40	Fabaceae	*Acacia divergens*	
41	Fabaceae	*Acacia gilbertii*	
42	Fabaceae	*Acacia pulchella* var. *goadbyi*	

Number	Family name	Species name	Naturalised
43	Fabaceae	*Bossiaea linophylla*	
44	Fabaceae	*Callistachys lanceolata*	
45	Fabaceae	*Chorizema diversifolium*	
46	Fabaceae	*Hardenbergia comptoniana*	
47	Fabaceae	*Hovea elliptica*	
48	Fabaceae	*Kennedia coccinea*	
49	Fabaceae	*Lotus subbiflorus*	*
50	Fabaceae	*Sphaerolobium medium*	
51	Geraniaceae	*Geranium dissectum*	*
52	Geraniaceae	*Geranium solanderi*	
53	Goodeniaceae	*Scaevola microphylla*	
54	Iridaceae	*Orthrosanthus laxus*	
55	Iridaceae	*Patersonia umbrosa* var. *xanthina*	
56	Juncaceae	*Juncus articulatus*	*
57	Juncaceae	*Juncus microcephalus*	*
58	Juncaceae	*Juncus pallidus*	
59	Lindsaeaceae	*Lindsaea linearis*	
60	Loganiaceae	*Orianthera serpyllifolia* subsp. *serpyllifolia*	
61	Lythraceae	*Lythrum hyssopifolia*	*
62	Malvaceae	*Lasiopetalum floribundum*	
63	Malvaceae	*Thomasia* sp. Big Brook (M. Koch 2373)	
64	Malvaceae	*Thomasia* sp. Vasse (C. Wilkins & K. Shepherd CW 581)	
65	Myrtaceae	*Corymbia calophylla*	
66	Myrtaceae	*Eucalyptus diversicolor*	
67	Myrtaceae	*Eucalyptus marginata*	
68	Myrtaceae	*Eucalyptus patens*	
69	Myrtaceae	*Melaleuca microphylla*	
70	Myrtaceae	*Melaleuca preissiana*	
71	Myrtaceae	*Melaleuca viminea*	
72	Myrtaceae	*Taxandria linearifolia*	
73	Myrtaceae	*Taxandria parviceps*	
74	Orchidaceae	*Caladenia flava* subsp. *sylvestris*	
75	Orchidaceae	*Caladenia longicauda*	
76	Orchidaceae	*Cryptostylis ovata*	
77	Orchidaceae	*Cyrtostylis huegelii*	
78	Orchidaceae	*Elythranthera emarginata*	
79	Orchidaceae	*Pterostylis turfosa*	
80	Orchidaceae	*Pterostylis vittata*	
81	Orchidaceae	*Pterostylis* sp. Bloated snail orchid (W. Jackson BJ 486)	
82	Orchidaceae	*Pyrorchis nigricans*	
83	Orchidaceae	*Thelymitra macrophylla*	
84	Poaceae	*Aira cupaniana*	*
85	Poaceae	*Anthoxanthum odoratum*	*
86	Poaceae	*Avena barbata*	*
87	Poaceae	*Briza maxima*	*

Number	Family name	Species name	Naturalised
88	Poaceae	*Bromus diandrus*	*
89	Poaceae	*Bromus hordeaceus*	*
90	Poaceae	*Dactylis glomerata*	*
91	Poaceae	*Holcus lanatus*	*
92	Poaceae	*Phalaris canariensis*	*
93	Poaceae	*Tetrarrhena laevis*	
94	Poaceae	*Vulpia bromoides*	*
95	Podocarpaceae	*Podocarpus drouynianus*	
96	Polygonaceae	*Rumex crispus*	*
97	Polygonaceae	*Rumex vulgaris*	
98	Primulaceae	*Lysimachia arvensis*	*
99	Proteaceae	*Banksia grandis*	
100	Proteaceae	*Banksia grandis*	
101	Proteaceae	*Persoonia longifolia*	
102	Ranunculaceae	*Clematis pubescens*	
103	Ranunculaceae	*Ranunculus muricatus*	*
104	Rhamnaceae	*Trymalium odoratissimum*	
105	Rosaceae	*Rubus anglocandicans*	*
106	Rubiaceae	*Opercularia apiciflora*	
107	Rubiaceae	*Opercularia hispidula*	
108	Rutaceae	*Chorilaena quercifolia*	
109	Stylidiaceae	*Levenhookia pusilla*	
110	Stylidiaceae	*Stylidium amoenum*	
111	Stylidiaceae	*Stylidium rhynchocarpum*	
112	Thymelaeaceae	*Pimelea clavata*	
113	Violaceae	*Hybanthus debilissimus*	
114	Xanthorrhoeaceae	*Xanthorrhoea gracilis*	
115	Zamiaceae	*Macrozamia riedlei*	
116		Unidentified fern	